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INVESTMENT RISK PROFILE OF THE MILLENNIAL GENERATION

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ABSTRACT OF
BACHELOR'S THESIS

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Title of thesis: Investment risk profile of the Millennial generation

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Objectives: The main objectives of this study were to determine the risk profile of the Millennial generation, to study the differences between European and US millennials as well as between male and female millennials, and to study the influence of financial knowledge on risk capacity, risk need, and risk preference.

Summary: The study will use a survey to collect data on millennials who hold either US or European nationality. The data will be analyzed with descriptive results, T-test, correlation, and regression analyses. The findings, limitations, implications for International Business as well as suggestions for future research will be reported in the conclusion.

Conclusions: In terms of risk profile, there are no significant differences between European and US millennials. However, there are significant differences between male and female millennials' risk profile. Additionally, financial knowledge has a positive but weak relationship with risk capacity, risk need, and risk preference.

Key words: risk profile, questionnaire, millennials, investment, European, US, gender, financial knowledge, risk capacity, risk need, risk preference

Language: English

Grade:

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1. Introduction

Millennials will constitute the majority of world population in the coming years, which means they will be the main participants in the financial markets. Moreover, risk profiling is an important factor that affects investment decision-making process. By determining the risk profile of clients, financial service providers can formulate suitable financial plans and investment strategies for their customers. Thus, it is of utmost importance to understand the investment risk profile of millennial clients. While current literature has various studies and researches concerning the investment risk profile of Baby Boomers, there is not much literature which thoroughly describes that of millennials. Therefore, this paper aims to fill the gap in current literature by determining the basic characteristics of Millennial generation's risk profile using the questionnaire.

By using a risk profile questionnaire, this research paper attempts to answer the following questions:

1. What is millennials' investment risk profile?
2. What are the differences in risk profiles of US and European millennials?
3. What are the differences in risk profile between different genders: male and female?

The paper choses US and European millennials as the subjects of the study because they are very large groups of millennials and they constitute the majority of the generation. Additionally, the study also focuses on the differences between male and female due to the fact that it has been reported in the literature that male and female of the Baby Boomer generation did have very different risk profiles, as suggested by the study of Grable (2013).

This paper starts with a literature review, which reviews the studies as well as agrees on a specific set of determinants for the risk profile. Then the methodology with which the research is carried out is discussed. The data which are collected for the research are reported in the fourth section. After that, the data are analyzed, and the discussion continues. Finally, the research ends with the main findings, current limitations, and suggestions for future research. The next part of the paper is the

literature review on risk profiling practice, which helps to define terms and review past works on the subject.

2. Literature review

While current literature has various studies and researches concerning the investment risk profile of Baby Boomers such as the studies of Gilliam, Chatterjee and Zhu (2010), Hallahan, Faff and McKenzie (2004), Sung and Hanna (1996), as well as Grable and Joo (1999), there is not much literature that thoroughly describe that of millennials. Nonetheless, it is undoubtedly important to understand the literature researching the risk profile formulation, the risk profile of baby boomers and what has been done with regards to the risk profile of the millennial generation. Therefore, this literature review will evaluate current researches and works concerning the risk profile, the baby boomer and millennial generations.

The literature review will start with a revision of the terminologies in the field of risk profiling. The terminologies can be confusing and contradictory. Therefore, to avoid such confusion, one needs to review the terminologies and agree on the key definitions. Thus, the paper will continue by discussing various determinants of a risk profile and then conclude on a customized version used specifically for this paper's purpose. Thirdly, the paper will continue by defining the baby boomer generation, followed by a discussion of its risk profile. More importantly, the literature review will then look at the work that has been done in risk profiling for millennials. Additionally, a conceptual framework would follow the discussion about millennials' risk profile. The framework would show the approach and structure of this thesis paper. Ultimately, the conclusion will summarize the main ideas that have been previously presented in the literature review. The following section will define various terminologies related to risk profile and its components.

2.1. Financial risk profile

2.1.1. Terminologies

Risk profiling is an evaluative process designed to determine the optimal level of risk corresponding to the traits of the clients. The term risk profile is used widely in multiple finance publications and in professional services. In those fields, risk tolerance and risk preference are two notable terms that have been mistakenly used interchangeably to refer to risk profile. In their article, Nobre and Grable (2015) provided a definition of multiple terms that are often mistakenly used to describe risk profile and its components. The most popular term is risk tolerance, which, according to Cordell (2001), is the maximum amount of risk that a person can tolerate when making a financial decision. The inverse of risk tolerance is called risk aversion. It measures the client's unwillingness to participate in risky situation. Another term is risk capacity, which gauges a person's ability to withstand potential loss resulting from taking risk. Risk propensity, or risk composure, as termed by Carr (2014), is the tendency to behave consistently under risk. Finke and Guillemette (2016) explained the term as "the ability to reflect on market volatility and avoid an impulsive response". Some also used the "risk appetite" as replacement for risk composure although the term should have the same meaning as risk need. Risk need describes the level of risk purposefully taken by the client in order to achieve financial goals. Usually confused with risk tolerance, risk preference is the attitudinal preference towards risky alternatives. In other words, it is the general feeling toward risk and a person's order of ranking based on the attractiveness of different choices. Risk perception is also misleadingly used occasionally to describe risk tolerance. Risk perception is the "cognitive appraisal" of the risk entailed in a financial decision. It is subjective, as it involves thinking and judging the attractiveness of the risk/reward tradeoff inherent in a decision. With the above-mentioned definition of terminologies, the following section will continue to discuss about various determinants of a risk profile.

2.1.2. Determinants of a risk profile

The terms described above are some of many risk profile components. Apparently, the use of these factors to constitute a risk profile also varies greatly. Cordell (2001)

considered risk propensity, risk attitude, risk capacity and risk knowledge as the determinants of a risk profile. It is important to note that in his article he used the term risk attitude to describe the client's willingness to include risk in their financial decision. It is different from risk propensity, which measures the client's past actions. The author measured risk attitude by observing the client's response to questions about risk. Thus, Cordell's definition of risk attitude concurs more with Nobre and Grable's definition of risk preference, as they both look at a person's feeling towards risk. Nobre and Grable (2015), however, has a different risk profile formula. In the article by Nobre and Grable (2015), they explained that risk profile is composed of a relatively stable set of elements, which means that they will remain constant overtime. Thus, risk knowledge is rejected as a factor of the risk profile, as one may gain more understanding about risk and the risk-reward trade-off through education. Nobre and Grable's version of risk profile contains risk capacity, risk composure and risk preference. Caviezel, Bertoli-barsotti, and Lozza (2011) introduced another version of risk profile in their study. Their version includes risk preference, time horizon and financial knowledge and experience. Another possible combination is risk capacity, risk tolerance and risk required (Riskprofiling.com, 2016). Here, risk required is synonymous with risk need. The examples above have illustrated that there are various versions of the risk profile. They also show that the terminologies are also inconsistent across different researches. More specifically, terms are sometimes used with different meaning and dependent on the authors' intention. Therefore, for the purpose of clarity of this research paper, it is essential to use a uniform set of elements to measure the risk profile of millennials. Thus, the next part of this paper will decide on the determinants which will be used to constitute a risk profile.

2.1.3. This paper's version of risk profile

This research paper will analyze millennials' risk profile in four aspects. The survey will determine their risk preference, their risk appetite, their capacity for risk and their risk knowledge. This risk profile framework closely resembles that of Nobre and Grable. However, in this research paper, risk preference will also include the person's risk tolerance, or how much risk a person can take in making their decision. As the survey questions will ask the responders to rank investment options based on

risk-reward tradeoff. Because such questions will simultaneously determine their attitude towards risk and their preference for maximum risk, it is more reasonable to include risk tolerance as a part of risk preference.

2.2. Baby boomer generation's financial risk profile

2.2.1. Baby Boomer generation definition

There are various definitions of the Baby Boomer generation, also known as the gray market or the third generation, according to Haynes (2004). Grable (2013) defined the generation in his article as those who were born between 1946 and 1964. Wellner (2000) concurred and further indicated that there are more specified categories within the generation. He believed that those who were born in the period of 1946 – 1953 were substantially distinct from those born between 1954 and 1964. With a slight modification, Schewe, Geoffrey and Noble (2000) termed the two sub-cohorts as leading-edge boomers, whose year of birth was from 1946 to 1954, and trailing-edge boomers (the rest of the cohort). This is because the authors believed that leading-edge boomers experienced a better economic environment than their descendants did. Wellner later suggested another definitive categorization in which he divided the generation into three groups: those who were born in the first five years of the generation (1946-1950), those born in the middle period (1951-1959), and those born in the last five years (1960-1964). The first sub-cohort of Baby boomers was termed "leading boomers" and the last was called "trailing boomers". Wellner argued that due to significantly different economic and socio-political environment that the two sub-cohort experienced, they would possess widely different economic behaviors and characteristics. Based on the work of Wellner (2000) and current literature, Gilliam, Chatterjee and Zhu (2010) described these groups as leading boomers, core boomers and trailing boomers, respectively. They also believed that there exists certain heterogeneity among these three groups, explained by the same factors put forward by Wellner (2000).

2.2.2. Baby boomers' risk profile

Much research has been done with regards to the risk profile of baby boomers. In their empirical study, Gilliam, Chatterjee and Zhu (2010) found that trailing boomers have the highest risk tolerance, core baby boomers have average risk tolerance and leading boomers have significantly lower risk tolerance. The research result also agreed with past research done by Hallahan, Faff and McKenzie (2004), stating that men are more risk tolerant than women across the three sub-cohorts. Gilliam, Chatterjee and Zhu (2010), Hallahan, Faff and McKenzie (2004), Riley and Chow (1992), Sung and Hanna (1996), and Grable and Joo (1999) all agreed on the finding that education has a positive influence on financial risk tolerance. The studies found that baby boomers with high school diploma, higher education diploma have a higher tendency of higher risk tolerance level. The above authors' also discovered in their studies that age is negatively correlated with risk tolerance level. Thus, it is now widely accepted that age is a negative determinant of risk tolerance. Another determinant of risk tolerance is income. On average, higher income earning baby boomers have been proven to have higher level of risk tolerance. Nevertheless, interestingly, past studies also suggested that while married leading boomers are more willing to take more risk, married trailing boomers showed the opposite pattern. Grable (2013) also suggested that baby boomer women are less willing to take risk than baby boomer men. His paper showed that men allocated on average larger percentage of risky assets to their portfolios compared to women. Grable explained the parity with three theories. He believed that the difference stemmed from the differences in knowledge and experience, socioeconomic factors and socialization factors. Baby boomer men dominated formal training and education and had more experiences in taking risk because they were raised with the mindset that men should be encouraged in taking risks. And given baby boomer women's lower economic position in that time period, it is relatively reasonable to conclude that women were more risk averse than men. Another possible explanation put forward by Grable is derived from the power and control theory of socialization. It is said that households in which the father is the dominant figure will result in more risk tolerant boys and risk averse girls. Therefore, in the patriarch society of baby boomers, it is likely that the level of risk tolerance and risk preference of men would be higher than those of women. The above as well as many other explanations for the disparity

between men and women are readily available in current literature (Grable, 2013). But unfortunately, no official theories have been put forward explaining the relationship between income and risk profile as well as between education and risk profile. Other studies have shown that baby boomers are less likely to take risk than generation X, which is the generation of those who were born between 1965 and 1979 (spectrem.com, n.d.). The research had shown that only 37% of baby boomers investors are willing to take on more risk in search for higher return, compared to 66% of generation X investors. Thus, it can be concluded that generally, baby boomers are more risk averse than their successors. The above section has thoroughly described baby boomer generation's risk profile. In the next part, millennial generation's financial risk profile will be explored in the context of contemporary literature.

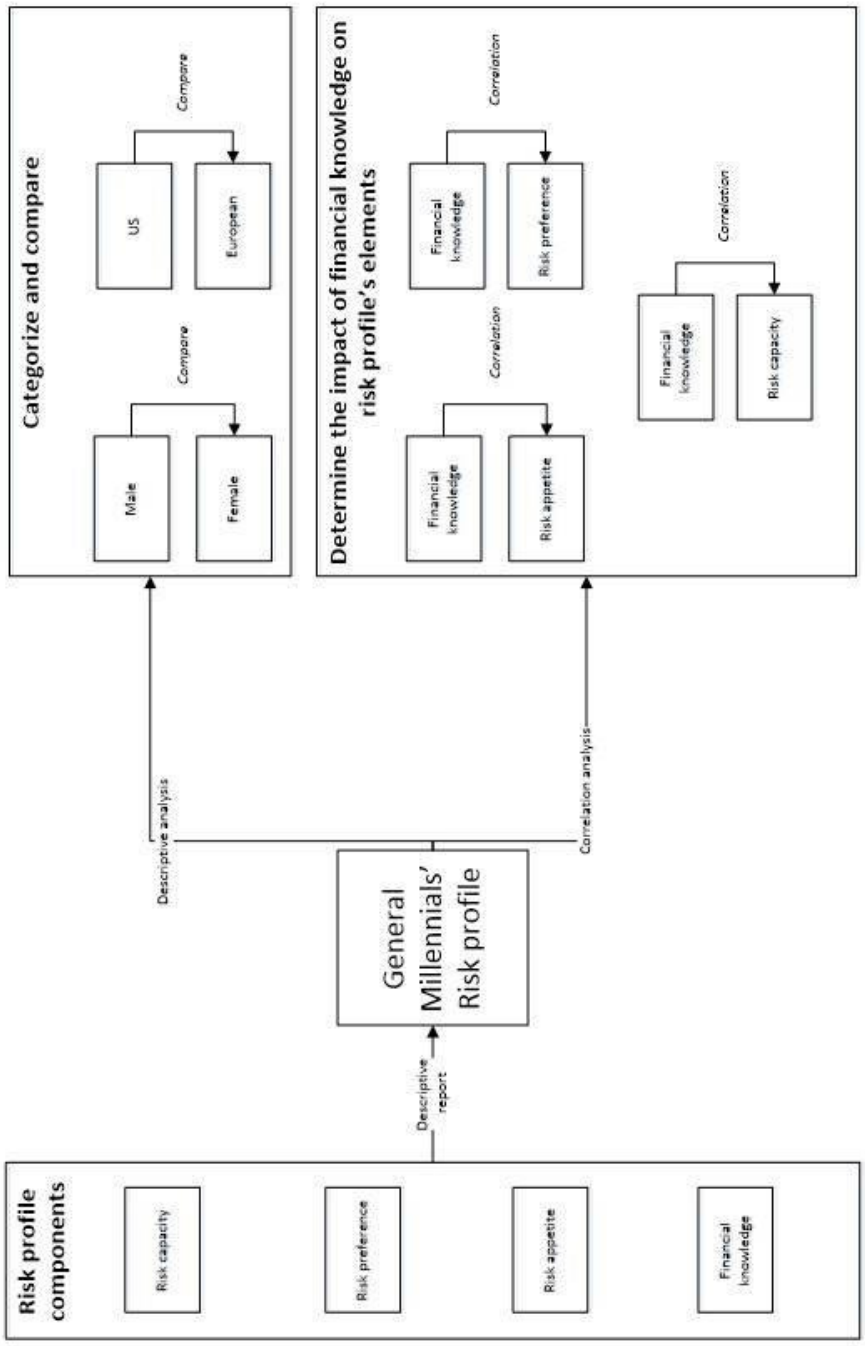
2.3. Millennial generation's financial risk profile

Cutler (2015) described millennials are those who were born between 1980 and 2000, which mean at this time they are in the age range of 17-38. Goldman Sachs demographic report also concurred with that definition (Goldman Sachs., 2016). Despite the young age, the millennial generation is relatively risk averse. The data from Bankrate.com's Financial Security Index (2014) showed that 39% of millennial working adults in the U.S prefer cash as their retirement investment vehicle. The number of millennials who prefer using cash as an investment option is much larger than the number of millennial stock investors. The data also showed similarity between millennials and baby boomers in terms of keeping their investment risk low (Plansponsor.com, 2014). BlackRock's Global Investor Pulse survey's findings also suggested that 48% of millennials responded that they would allocate most of their portfolios to cash or bonds, despite lower returns, in exchange for lower long-term risk. And only 12% of them said that they would invest their money into the stock market. High-net-worth individuals in this demographics have been reported to keep, on average, 20%-25% of their investment portfolio in cash. And 75% of such individuals are planning to increase that percentage (Henricks, 2014). The author believed that such risk averse pattern is the result of the financial crisis of 2008-2009. The crisis had redefined the concept of risk in millennials' mind. They think of risk as potential loss rather than market volatility. Thus, they are unwilling to take

more risk to earn higher reward. David (2014) offered another explanation for the risk aversion of millennials. The author indicated that due to fact that the time frame in which millennials are exposed to is a high volatility, low return in equity period, when bonds outperform the stock market, millennials have grown a distaste for the stock market, and thus decide to hoard cash as a retirement planning options.

Further study of millennials' risk profile has also shown that the level of cognitive ability has no effect on risk perception, which means that IQ is not a determinant of risk perception. Nonetheless, similar to baby boomers, gender does have an effect on risk preference of millennials. Young women are observed to have lower risk tolerance than young men in the millennial cohort, in spite of the fact that young women assess themselves as more risk tolerant than their male counterparts (Booth & Katic, 2013). Additionally, Larson, Eastman & Bock (2016) had determined in their study that individuals with higher subjective financial knowledge, more familiar with financial planning process selected riskier retirement investment option (100% stock portfolio instead of 100% annuity portfolio). So, as seen from the researches above, similar phenomena apply to both baby boomers and millennials. It can be concluded that in both generation, financial knowledge and gender are two factors that can help determine a person's risk profile. Two consistent findings are: those with higher knowledge tend to have higher risk tolerance and risk preference; and men are generally less risk averse than women.

2.4. Conceptual Framework



To sum up, the literature has shown that there are various determinants of risk profile, and some researchers used different variations of such factors to create their version of risk profile. Therefore, for the purpose of clarity, this paper will use risk preference, risk appetite, risk capacity, and risk knowledge to measure millennials' risk profile. The literature also shows that many researches have been done regarding the baby boomers' risk profile. There has been found to be a disparity between the risk tolerant level of male baby boomers and that of female baby boomers. Moreover, it is agreed that education, financial knowledge, experience, income, and age are all key determinants of baby boomers' risk profile. Interestingly, millennials are observed to be very similar to baby boomers in various aspects. Like baby boomers, individuals of the millennial generation are generally risk averse and are less likely to take risky positions. In both generations, it can be agreed that knowledge is positively correlated with risk tolerant level of the clients. In addition to knowledge, gender is also a defining factor of a risk profile, as men are relatively more risk tolerant than women in these two cohorts. These conclusions are highly crucial in formulating the questionnaire used in this research paper, and provide clear direction in answering the research questions of the thesis, which will be restated below:

1. What is millennials' investment risk profile?
2. What are the differences in risk profiles of US and European millennials?
3. What are the differences in risk profile between different genders: male and female?

3. Methodology

This paper investigates the millennials' risk profile, which contains risk capacity, risk need, and risk preference through a questionnaire distributed to various universities in Europe and the US. This section begins with a restatement of the research objectives followed by a discussion on the data collection method. Next, it continues to describe the preparation of the variables for analyses and the hypotheses which will be tested. Finally, the section ends with a discussion on the limitations of the methodology. The next part is the restatement of the research objectives.

3.1. Research objectives

This study aims to achieve the following specific research objectives:

1. To determine millennials' investment risk capacity.
2. To determine millennials' investment risk preference.
3. To determine millennials' investment risk need.
4. To determine millennials' level of financial knowledge.
5. To determine the impact of millennials' level of financial knowledge on their risk profile.
6. To compare the risk profile of different genders (male and female) in millennial generation.
7. To compare risk profiles of US and European millennials.

This research expands on previous literature that discovered the effect of financial knowledge and gender on risk tolerance, and sets out to determine the effect of financial knowledge and gender on millennials' risk profile determinants. It also compares the risk profiles of millennials in Europe and the US to see if geography is a factor that affects risk profile. In the next section, it will explain how the survey is designed to collect appropriate information so as to achieve these objectives.

3.2. Data collection

3.2.1. Designing the questionnaire

The main constructs at the heart of this study are level of financial knowledge, risk capacity, risk need, and risk preference. The standard method to collect the information that describes these constructs in the financial industry is using a survey. Compared to paper-and-pencil survey and telephone-administered survey, an online survey has many advantages such as low monetary cost, wider range of distribution, and easier data recording. Nonetheless, the largest disadvantage of online survey compared to other more direct ways of administering a survey is lower response rate.

The questionnaire consists of two parts: the main questions and demographic questions. The main part comprises 4 questions. The first one will ask the respondent to rate their level of financial knowledge. The second one is used to find out the respondent's risk capacity. The third one surveys the risk need. And the final question of the main part is used to ask the respondents about their risk preference. The rest of the survey is demographic questions, which ask about the respondents' gender, age, and nationality. The table 3.1 in the appendices section contains the full questionnaire used for this study:

3.2.2. Recording data

Each of the main questions has five choices, which are coded with a score of 1 to 5. The purpose of the score is to represent the choice on a low-high spectrum on the dimension that the question is measuring, as illustrated in Figure 3.1:

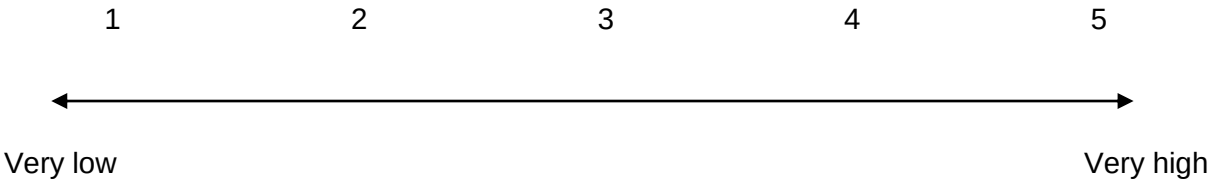


Figure 3.1: Low-high spectrum

Table 3.2 shows how scores are assigned for each question.

1. Please rate your level of financial knowledge. Please click on the option that you choose.

Very low	1	2	3	4	5	Very High

2. What percentage of your monthly income would you be willing to spend on lotteries if you know that there is 50% chance of winning 100% of your investment or losing 90% of what you spend?
    a. 0% (1)
    b. 20% (2)
    c. 40% (3)
    d. 60% (4)
    e. 80% (5)

3. How would you allocate your investment portfolio?
    a. 100% safe assets (1)
    b. 30% risky assets, 70% safe assets (2)
    c. 50% risky assets, 50% safe assets (3)
    d. 70% risky assets, 30% safe assets (4)
    e. 100% risky assets (5)

4. Please select the most attractive portfolio to you.
    a. 20% risky assets, 80% safe assets, 5% expected return (1)
    b. 35% risky assets, 65% safe assets, 7.5% expected return (2)
    c. 50% risky assets, 50% safe assets, 10% expected return (3)
    d. 65% risky assets, 35% safe assets, 14% expected return (4)
    e. 80% risky assets, 20% safe assets, 20% expected return (5)

Table 3.2: Assigned scores for main questions

The answers are then recorded in terms of the score that they are assigned. Missing items are assigned the score of -99, and will be excluded from the test. The gender will be coded as ”1” for ”Male”, ”2” for ”Female”, and ”3” for ”Other”. Similarly, nationality is coded as ”1” for” European” and ”2” for ”US”. For example, below is the data set generated by the survey and will be used for further analysis:

Respondent	Q1	Q2	Q3	Q4	Q5	Q6	Q7
#1	1	3	3	3	1	1	1997
#2	3	4	4	4	2	2	1998
#3	4	5	5	5	1	1	1992
#4	2	2	2	2	2	2	1990
#5	-99	3	1	1	-99	3	1985
#6	1	1	4	2	2	2	2000
#7	2	2	2	2	2	3	1987

Table 3.3: Example of coded data set

3.2.3. Population, sample and survey administration

The target population for this study is individuals who belong to the Millennial generation (those who are born between 1985 and 2000) and hold either European or US nationality. The sample used for this survey is university students from where the survey was distributed. The reason why university students are selected is because they constitute a large portion of the Millennial generation. Moreover, university students also have connection to the Internet to complete the online survey.

The online survey was distributed to various universities in Europe and the US. The list of the university contains: Aalto University (Finland), Mikkeli University of Applied Sciences (Finland), HAN University of Applied Sciences (the Netherlands), Gustavus Adolphus College (the US), Soka University of America (the US), and Mount Holyoke College (the US). The above institutions have bodies of students majoring in different areas, including finance, economics, business, and many non-business-related areas. Thus, the sample is expected to possess a variety of level of financial knowledge. They also have a mix of genders which will serve the objectives of this study.

The survey's publish clearance was granted on Monday, March 13, 2017. The link to the survey was distributed to social media groups of students in the above-mentioned universities in the same day. Participation is completely voluntary.

Before it was published online, the survey had undergone various changes and tests, which will be described in the next section that details the pre-test of research instrument.

3.2.4. Pre-test of instrument: testing the questionnaire

The questionnaire was first reviewed by peers for language use, and then by a professor for content revisions. Some changes further to the pilot study were necessary in order to ensure clarity and uniformity. For example, as many people are not well educated in the use of financial instruments, the answer which concerns the use of stocks and bonds in the portfolio was changed to risk and safe assets. The

change increases the clarity and comprehensibility of the answers, which can yield more accurate results. Another change was made in question 2, in which the respondents were asked to select how much to spend on a type of lottery. The lottery in the original question has an expected return of 0% (win 100% and lose 100%), hence it does not create incentives for people to spend money on it. Therefore, the lottery was changed to have 10% expected return (win 100% and lose 90%). Also in the second question, the scale was adjusted to 0%-80%. It was originally 0%-100%. However, it is unrealistic to spend all of one's income on a lottery without setting aside a portion of income to ensure survival. Such scale would fail to correctly reflect the risk capacity of the respondents because the expected number of people who select 100% would be 0. Changes were also made for question 4, which asks about risk preference. Originally it was designed for respondents to rank the top three most attractive portfolios. Because each answer is assigned a score from 1 to 5 which reflects the level of risk averse or risk aggressive, the total score of this question can surpass 5. The analysis and discussion on risk profile assume that the weight of each determinant of the risk profile is the same. Therefore, the score of each question must be on a 1-5 range. Henceforth, the question was adjusted to ask for the most attractive portfolio to ensure uniformity.

After the survey's content had been appropriately adjusted, the survey was distributed to a small group of students for a pilot test. It does not generate any error in term of data recording. The data generated by the pilot test will not be used for the study. The respondents provided an insight that the average time to complete the survey is 2 minutes.

Moreover, along with the draft survey, a document which entails the data collection, report and analysis procedure was also submitted to the supervising professor for approval. The survey was published soon after approval was granted.

The next part of this paper will describe how the data will be analyses. It will start with a summary of the hypotheses which will be tested. Then it continues with the discussion on the types of tests that will be done.

3.3. Data Analysis

3.3.1. Hypotheses

Derived from the research objectives, the following hypotheses will be tested in this study:

a. H0: European millennials do not have significantly different risk profile than their US counterparts.
   H1: European millennials have significantly different risk profile than their US counterparts.
b. H0: Male millennials do not have significantly different risk profile than their female counterparts.
   H1: Male millennials have significantly different risk profile than their female counterparts.
c. H0: Level of financial knowledge does not have a positive relationship with risk capacity.
   H1: Level of financial knowledge has a positive relationship with risk capacity.
d. H0: Level of financial knowledge does not have a positive relationship with risk need.
   H1: Level of financial knowledge has a positive relationship with risk need.
e. H0: Level of financial knowledge does not have a relationship with risk preference.
   H1: Level of financial knowledge has a relationship with risk preference.

The first a. and b. hypotheses will be done by two independent samples T-test for significance of differences. And the last three hypotheses will be done with correlation tests and regression tests for more details about the relationships between the tested variables.

3.3.2. T-tests for statistically significant differences

This test will use the total risk profile score, which is the total score of the questions 2, 3 and 4. It will test whether the differences in risk profile between specific group of millennials are significant.

For the first test, the first variable will be the risk profile score of the surveyed millennials in Europe (coded as EU(rpc)). The second variable will be that of their US counterparts (coded as US(rpc)).

For the second test, the first variable will be the risk profile score of the surveyed male millennials (coded as M(rpc)). The second variable will be that of the female counterparts (coded as FM(rpc)).

Test	Hypotheses	Sample size	Variable 1	Variable 2	Confidence level
1	H0: European millennials do not have significantly different risk profile than their US counterparts.	Total number of valid respondents	EU(rpc)	US(rpc)	95%
2	H0: Male millennials do not have significantly different risk profile than their female counterparts.	Total number of valid respondents	M(rpc)	FM(rpc)	95%

Table 3.4: T-tests summary

The failure to reject the null hypotheses above means that there are no significant differences in the variables tested. Also, if the results suggest that the alternative hypotheses are correct, it also means that the differences in the testing variables are not significant.

3.3.3. Correlation Tests

In order to see the relationship between financial knowledge and the three determinants of risk profile, this paper will use three correlation tests. The test would provide insights into the strength of the relationship between these variables.

The sample size would be the total number of respondents. The minimum sample size is 30. The variables will be the data generated by question 1 to question 4. In the table below I label those data as “Q1”, ”Q2”, ”Q3” and “Q4”.

Test	Hypotheses	Sample size	Variable 1	Variable 2
3	H0: Level of financial knowledge does not have a positive relationship with risk	Total number of valid respondents	Q1	Q2

	capacity.			
4	H0: Level of financial knowledge does not have a positive relationship with risk need.	Total number of valid respondents	Q1	Q3
5	H0: Level of financial knowledge does not have a relationship with risk preference.	Total number of valid respondents	Q1	Q4

Table 3.5: Correlation tests summary

3.3.4. Regression tests: Assess if changes in the level financial knowledge predict changes in the determinants of risk profile

As we have the relationship, we will continue to use regression analysis to further relationship between the level of financial knowledge and the determinants of risk profile. The table below contains inputs for the regression analysis.

Similar to the correlation analysis, the sample size would be the total number of respondents. The minimum sample size is 30. The variables will be the data generated by question 1 to question 4. In the table below I label those data as “Q1”, “Q2”, “Q3” and “Q4”.

Test	Hypotheses	Sample size	Interdependent variable	Dependent variable	Confidence level
6	H0: Level of financial knowledge does not have a positive relationship with risk capacity.	Total number of valid respondents	Q1	Q2	95%

7	H0: Level of financial knowledge does not have a positive relationship with risk need.	Total number of valid respondents	Q1	Q3	95%
8	H0: Level of financial knowledge does not have a relationship with risk preference.	Total number of valid respondents	Q1	Q4	95%

Table 3.6: Regression tests summary

3.4. Limitations

The methodology of this study, however, does present a few limitations. First of all, the population of this study is the millennials whose nationality belongs to one of the two group European or the US. Compared to the population, the sample sized used for this study is too small. Therefore, extrapolation based on the results generated by this study might be subject to error. Secondly, there might be other variables other than financial knowledge which are not studied in this study that do influence the dependent variables. Thirdly, as the sample is a collection of university students, their level of financial knowledge might be higher than the average population as they are more likely to receive formal study in finance-related fields. Therefore, the average score for the variable indicating the level of financial knowledge can be unrealistic. And in the next part, the paper will present the data report, which will include the response rate and descriptive results.

4. Data Report

4.1. Response rate

Despite being distributed to several large universities, the survey does not have a high response rate. The total number of students in the target universities was 47,311. However, the survey only yielded 68 results, which means the response rate is at 0.14%. The response rate is low due to various possible reasons. Firstly, it is common for online survey to yield a low amount of responses. Secondly, the survey is available for responding for only 5 days. Such a short time period may be the cause of low response rate. Thirdly, as the topic of the questionnaire is very specific and highly specialized, the survey may not appeal to everyone. The above reasons might explain the low response rate of the questionnaire used for this study.

Overall, the survey has 98.5% of valid answers that can be used for further analysis. Table 4.1 below will show the number of valid and missing answers for each question in the survey.

	Response					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Question 1: Financial Knowledge	67	98.5%	1	1.5%	68	100.0%
Question 2: Risk capacity	67	98.5%	1	1.5%	68	100.0%
Question 3: Risk need	67	98.5%	1	1.5%	68	100.0%
Question 4: Risk preference	67	98.5%	1	1.5%	68	100.0%
Question 5: Nationality	67	98.5%	1	1.5%	68	100.0%
Question 6: Gender	67	98.5%	1	1.5%	68	100.0%
Question 7: Year of birth	67	98.5%	1	1.5%	68	100.0%

Table 4.1: Response summary

Among the 67 valid responses, 37 belong to female millennials and 30 belong to their male counterparts. Also, 37 of the respondents have nationality as European and 30 of them are US permanent residents. The years of birth of the respondents

range from 1988 to 1999. In the next part, more information that describes the surveyed sample will be discussed.

4.2. Descriptive results

The specific distribution of each answer is listed in the Table 4.2 below.

	1		2		3		4		5	
	N	%	N	%	N	%	N	%	N	%
Q1: Financial knowledge	2	3.0%	25	37.3%	24	35.8%	13	19.4%	3	4.5%
Q2: Risk capacity	21	31.3%	25	37.3%	9	13.4%	8	11.9%	4	6.0%
Q3: Risk need	8	11.9%	42	62.7%	8	11.9%	8	11.9%	1	1.5%
Q4: Risk preference	17	25.4%	29	43.3%	9	13.4%	9	13.4%	3	4.5%

Table 4.2. Distribution of answers

The pie charts below will visually represent the distribution of answers for each question in the survey.

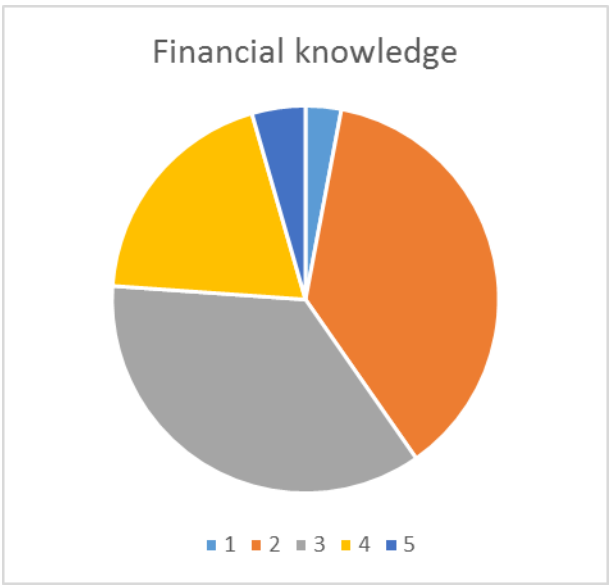


Chart 4.1. Distribution of answers for Question 1

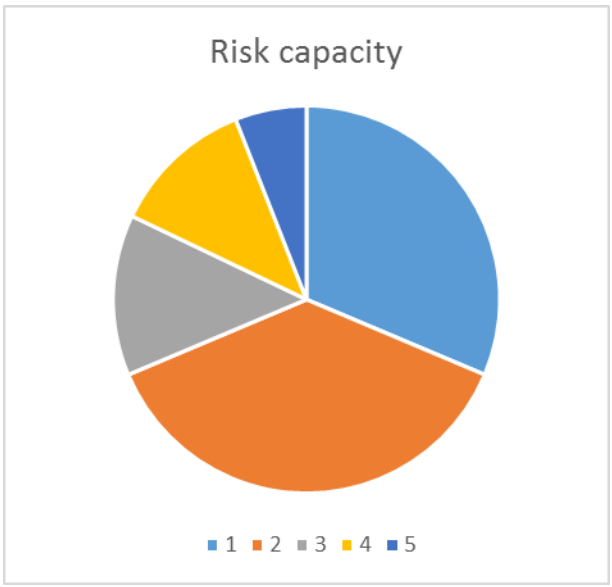


Chart 4.2. Distribution of answers for Question 2

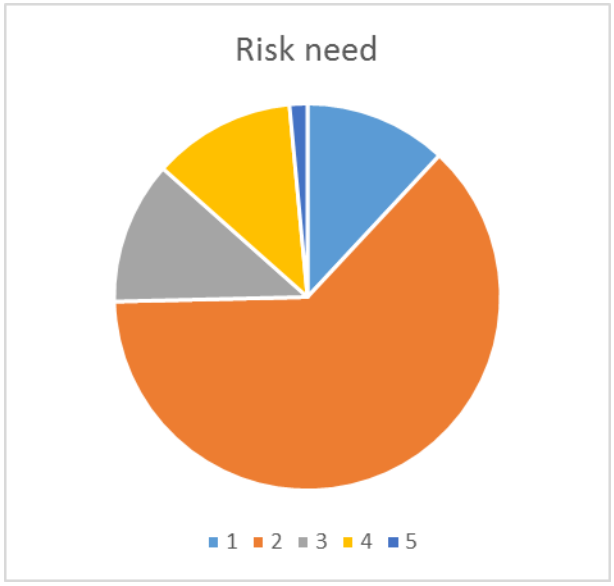


Chart 4.3. Distribution of answers for Question 3

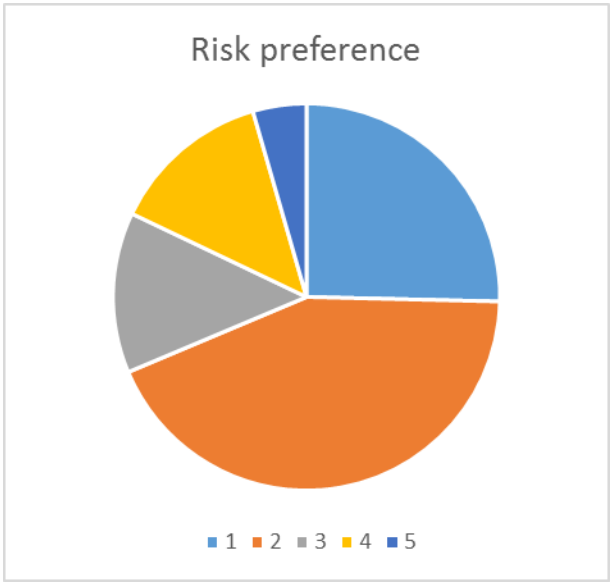


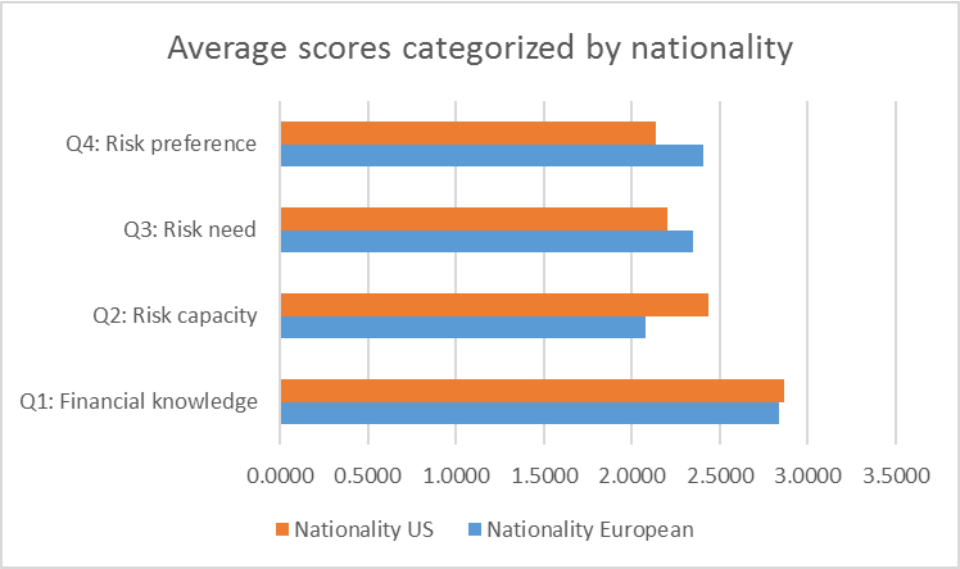
Chart 4.4. Distribution of answers for Question 4

As can be seen from the Table 4.2 and from the Chart 4.1, 4.2, 4.3, and 4.4, most of the respondents' level of financial knowledge is at low or average level. Together they make up 73.1% of the sample. 31.3% of the respondents have very low risk capacity, and 37.3% of the surveyed sample have low risk capacity. A very large portion of the surveyed millennials (62.7% of the sample) has low risk need. And the result for the question 4, which surveys the risk preference of millennials shows that the majority of the surveyed samples are very risk-averse or somewhat risk-averse.

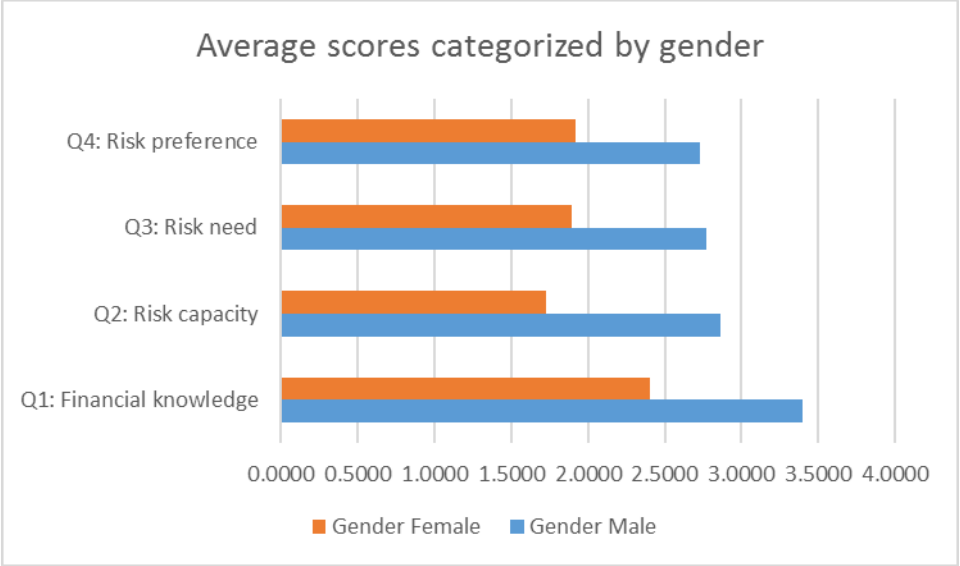
And in order to see the difference between different groups, the sample will be categorized in two ways: by nationality and by gender. The average score of the questions for each category is detailed in Table 4.3 and is presented visually in the Graph 4.1.

	Nationality		Gender	
	European	US	Male	Female
Q1: Financial knowledge	2.8378	2.8667	3.4000	2.4054
Q2: Risk capacity	2.0811	2.4333	2.8667	1.7297
Q3: Risk need	2.3514	2.2000	2.7667	1.8919
Q4: Risk preference	2.4054	2.1333	2.7333	1.9189

Table 4.3. Average score for questions by groups



Graph 4.1. Average scores categorized by nationality



Graph 4.2. Average scores categorized by gender

The Graph 4.2 shows that there are large differences between male and female in all measured dimensions. This result is consistent with the findings in the contemporary literature, which suggests that there is a difference in investment risk profile of male and female millennials. It is notable that the survey measures the level of financial knowledge subjectively, which means that the result might be subjected to bias and over-confident problem. It can also be seen from the results that there are

differences between groups divided by nationality. Although the differences are not as notable as that of groups divided by gender.

The descriptive results have shown that there are differences between European and US millennials as well as between male and female millennials. In the next part of this study, we will analyze the data in more depth and have a discussion on the findings. We will start with two T-tests in order to see the significance of the differences in the two categories. Then the study will continue with three correlation analyses and end with three regression analyses.

5. DISCUSSION AND ANALYSES

5.1. European vs. US: T-test for statistically significance difference

5.1.1. Test 1:

The hypotheses for this test are as follows:

> H0: European millennials do not have significantly different risk profile than their US counterparts.
> H1: European millennials have significantly different risk profile than their US counterparts.

By combining the four items Q1, Q2, Q3, Q4, we have the new variable called risk profile score (rpc). Below is the statistics of the groups which will be compared in the test.

	Nationality	N	Mean	Std. Deviation	Std. Error Mean
Risk profile score	European	37	9.6757	2.62524	.43159
	US	30	9.6333	3.88173	.70870

Table 5.1. Group Statistics

The T-test has a confident level of 95%, which means alpha equals 0.05. The p-value of the F test indicates that equal variances are not assumed ($p = 0.012 < \text{alpha} = 0.05$). For the T-test, the t value is 0.051, which is very close to 0. Moreover, the p-

value of the T-test is 0.960, which is much larger than our alpha 0.05. This result means that we cannot reject the null hypothesis. As mentioned in the methodology, the failure to reject the null hypothesis means that the difference in risk profile between millennials in Europe and in the US that the study found earlier in the descriptive result section is indeed not significant.

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Risk profile score	Equal variances assumed	6.669	.012	.053	65	.958	.04234	.79761	-1.55059	1.63527
	Equal variances not assumed			.051	49.063	.960	.04234	.82978	-1.62510	1.70979

Table 5.2. Independent Samples Test

In the next section, a similar T-test for the significance of the difference between male and female will be performed.

5.2. Male vs female: a T-test for statistically significance difference

5.2.1. Test 2:

This test aims to test the below null hypothesis and alternative hypothesis:

> H0: Male millennials do not have significantly different risk profile than their female counterparts.
>
> H1: Male millennials have significantly different risk profile than their female counterparts.

The difference between means of the risk profile score of the two groups is larger than that between European and US millennials. The means suggests that on average, male millennials have higher risk profile score than female millennials.

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Risk profile score	Male	30	11.7667	3.35984	.61342

	Female	37	7.9459	1.79422	.29497

Table 5.3. Group Statistics

The alpha value is still at 0.05. Looking at the F-test we can see that the p-value (Sig.) is 0.01, which is smaller than the alpha value, which indicates that the test does not assume equal variances. Therefore, the T-value is 5.613, and the p-value of the T-test is 0, which suggests strong evidence against the null hypothesis. In other words, the result has shown that the alternative is correct – there is significant difference between male and female millennials in terms of investment risk profile. More specifically, male millennials' risk profile score is 3.82 point higher than that of their female counterparts.

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Risk profile score	Equal variances assumed	11.493	.001	5.955	65	.000	3.82072	.64158	2.53941	5.10204
	Equal variances not assumed			5.613	42.146	.000	3.82072	.68065	2.44725	5.19419

Table 5.4. Independent Samples Test

Moreover, looking at the Table 4.3, we can also see male millennials score higher in all dimensions of the risk profile that the survey measured. Subjectively, male millennials either have higher level of financial knowledge, or they are more confident in their financial knowledge. They have higher risk capacity and risk need. And they are more risk aggressive.

5.3. Correlation analyses

5.3.1. Test 3:

For this test, we have the following null hypothesis (H0) and alternative hypothesis (H1):

H0: Level of financial knowledge does not have a positive relationship with risk capacity.

H1: Level of financial knowledge has a positive relationship with risk capacity.

The following table is the summary of the correlation test result:

		Financial Knowledge	Risk capacity
Q1: Financial Knowledge	Pearson Correlation	1	.348**
	Sig. (2-tailed)		.004
	N	67	67
Q2: Risk capacity	Pearson Correlation	.348**	1
	Sig. (2-tailed)	.004	
	N	67	67

**. Correlation is significant at the 0.01 level (2-tailed).

Table 5.5. Q1-Q2 Correlations

The results show that financial knowledge and risk capacity of the surveyed millennials have a positive correlation. Pearson correlation of the two variable is 0.348. Moreover, the correlation is significant at the 0.01 level. Thus, the test succeeds in rejecting the null hypothesis.

5.3.2. Test 4:

For this test, we have the following null hypothesis (H0) and alternative hypothesis (H1):

H0: Level of financial knowledge does not have a positive relationship with risk need.

H1: Level of financial knowledge has a positive relationship with risk need.

The following table is the summary of the correlation test result:

		Financial Knowledge	Risk need
Financial Knowledge	Pearson Correlation	1	.330**
	Sig. (2-tailed)		.006
	N	67	67
Risk need	Pearson Correlation	.330**	1
	Sig. (2-tailed)	.006	
	N	67	67

**. Correlation is significant at the 0.01 level (2-tailed).

Table 5.5. Q1-Q2 Correlations

As seen in the result summary table, financial knowledge and risk need also have a positive relationship, as the Pearson correlation result is 0.330. This correlation is significant at the 0.01 level. Therefore, the alternative hypothesis H1 is correct.

5.3.3. Test 5:

The hypotheses of this test are:

H0: Level of financial knowledge does not have a relationship with risk preference.
H1: Level of financial knowledge has a relationship with risk preference.

The result of this test is summarized in this table:

		Financial Knowledge	Risk preference
Financial Knowledge	Pearson Correlation	1	.303*
	Sig. (2-tailed)		.013
	N	67	67
Risk preference	Pearson Correlation	.303*	1
	Sig. (2-tailed)	.013	
	N	67	67

*. Correlation is significant at the 0.05 level (2-tailed).

Table 5.7. Q1 -Q4 Correlations

The result is similar to that of the previous two tests; this test also shows a positive correlation between the tested variables. Pearson correlation is 0.303 and is significant at 0.05 level. As a result, for the test 6, the null hypothesis is also incorrect, which means the level of financial knowledge also correlates with risk preference in the sample surveyed.

5.4. Regression analyses

5.4.1. Test 6:

From the previous correlation test, it is concluded that financial knowledge does correlate with risk capacity. The Pearson correlation beta is 0.348 and is significant at the 0.01 level. In the following test, this study attempts to further explore the relationship between the two variables. In the table below is the descriptive summary of the two variables from a sample of 67 valid responses.

	Mean	Std. Deviation	N
Risk capacity	2.2388	1.19455	67
Financial Knowledge	2.8507	.92530	67

Table 5.8. Descriptive Statistics

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.348[a]	.121	.108	1.12846

a. Predictors: (Constant), Financial Knowledge

Table 5.9. Model Summary

The regression result shows that R square value is at 0.121, which means that only 12.1% of the variances in risk capacity can be explained by the change in financial knowledge. When adjusted, R square is reduced to 0.108, which is even smaller.

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11.407	1	11.407	8.957	.004[b]
	Residual	82.773	65	1.273		
	Total	94.179	66			

a. Dependent Variable: Risk capacity

b. Predictors: (Constant), Financial Knowledge

Table 5.10. ANOVA[a]

In the ANOVA table, the Sig. value of the regression suggests that the model predicts the dependent variable significantly well, since the Sig. value is smaller than alpha (0.05).

The unstandardized beta (B) shows that a change in one level of financial knowledge only causes 0.449-point change in the level of risk capacity.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.958	.450		2.131	.037
	Financial Knowledge	.449	.150	.348	2.993	.004

Table 5.11. Coefficients

In conclusion, the test results show a weak positive relationship between the level of financial knowledge and risk capacity. In the next test, we will test for the explore the relationship between financial knowledge and risk need.

5.4.2. Test 7:

Previous correlation analyses also suggest that financial knowledge and risk need have a positive correlation relationship. Pearson correlation result is 0.330 between the two variables, with a significant value of 0.006. Below is the descriptive statistics for the two variables tested.

	Mean	Std. Deviation	N
Risk need	2.2836	.88431	67
Financial Knowledge	2.8507	.92530	67

Table 5.12. Descriptive Statistics

The test's R square value is 0.109. This suggests that only 10.9% of the total variances of the variable risk need can be explained by the change in the level of financial knowledge. The adjusted R square is smaller at 0.095.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.330[a]	.109	.095	.84108

a. Predictors: (Constant), Financial Knowledge

Table 5.13. Model Summary

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	5.630	1	5.630	7.958	.006[b]
	Residual	45.982	65	.707		
	Total	51.612	66			

a. Dependent Variable: Risk need

b. Predictors: (Constant), Financial Knowledge

Table 5.14 ANOVA[a]

The ANOVA table shows that the regression's test result is correct since the p-value is 0.006, which is smaller than the test's alpha value. This result shows that the model correctly predicts the relationship between the two variables.

The coefficients table indicates that there is a weak relationship between the level of financial knowledge and risk need. More specifically, one unit change in the level of financial knowledge only lead to 0.316 change in the level of risk need.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	1.384	.335		4.129	.000	.715	2.053
	Financial Knowledge	.316	.112	.330	2.821	.006	.092	.539

a. Dependent Variable: Risk need

Table 5.15. Coefficients[a]

As indicated by the test result above, the relationship between financial knowledge and risk need is positive but weak. In the next and final test, we will analyze the relationship between financial knowledge and risk preference.

5.4.3. Test 8:

The Pearson correlation value of the two variables in this test is 0.303. The correlation has been suggested as significant due to the p-value of 0.013 (shown in Table 5.7.).

	Mean	Std. Deviation	N
Risk preference	2.2836	1.12554	67
Financial Knowledge	2.8507	.92530	67

Table 5.16. Descriptive Statistics

The test generates an R square value of 0.92 and an adjusted R square of 0.078. The result shows that only 9.2% of the total variances of the variable risk preference can be explained by the change in the level of financial knowledge.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.303[a]	.092	.078	1.08081

a. Predictors: (Constant), Financial Knowledge

Table 5.17. Model Summary

The ANOVA table show that the regression's test result is significant since the p-value is 0.006, which is smaller than the test's alpha value. This indicates that the model correctly predicts the relationship between the two variables.

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	7.683	1	7.683	6.577	.013[b]
	Residual	75.929	65	1.168		
	Total	83.612	66			

a. Dependent Variable: Risk preference

b. Predictors: (Constant), Financial Knowledge

Table 5.18. ANOVA[a]

The coefficients table reveals that there is a weak relationship between the level of financial knowledge and risk preference. More specifically, one unit change in the level of financial knowledge only leads to 0.303 change in the level of risk preference.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	1.232	.431		2.862	.006	.372	2.092
	Financial Knowledge	.369	.144	.303	2.565	.013	.082	.656

a. Dependent Variable: Risk preference

Table 5.19. Coefficients[a]

The result of the test has suggested a weak positive relationship between the level of financial knowledge and risk preference. In the next section, this paper will conclude with the main findings, limitations, implications for International Business as well as suggestions for future study.

6. CONCLUSIONS

6.1. Main Findings

Despite the small scale of the research, the study has been able to produce some meaningful findings. Firstly, the descriptive results show that in all dimensions measured by the survey, millennials generally have low risk capacity and low risk need, and they tend to be risk averse. Their average scores in the measured dimensions range from 1.8 to 2.8, which are below the average value of 3.

Secondly, the tests suggest that there is no significant difference between the risk profile of millennials whose nationality are either European or US. However, when categorized the surveyed sample into groups of male and female, T-test's result

shows that male and female millennials have significantly different risk profile. Male millennials have higher subjective level of financial knowledge and higher score in all determinants of the risk profile – risk capacity, risk need, and risk preference.

Thirdly, the correlation and regression analyses also show that financial knowledge does correlate with the three determinants of the risk profile. Nevertheless, the regression test's result shows that they only have positive but weak relationship.

The findings of this study are consistent with the findings in the literature in the field. It has confirmed that male and female millennials have very distinct investment risk profiles. Furthermore, it has also confirmed that financial knowledge is a factor that affects the other determinants of the risk profile although such influence is not significant. Most importantly, the study also confirms that millennials are generally risk-averse, as suggested in current literature.

The findings above do hold meaningful implications. However, there are limitations to this study and methodology which can be improved for future research. Such limitations will be discussed in the next section.

6.2. Limitations

The largest limitation to this study is the small sample size. As discussed in the methodology, due to the small sample size, the findings of this study may not be applicable to the larger population. Moreover, the survey can also include more items so that the dimensions can be measured thoroughly. Furthermore, the methodology of this study relies on simple correlation and regression. They do provide meaningful insights of the data collected; but with more complicated models of analyses, the result might be more reliable. Nonetheless, the findings revealed by this study can have implications for International Business, which will be discussed in the next part of the conclusion.

6.3. Implications for International Business

The first implication for International Business is based on the first test result. There is no significant difference in the risk profile of European and US millennials. This suggests that financial strategies and plans targeting European millennial clients can

also be used for US clients. Therefore, the finding is very crucial for companies that are trying to expand their operation from European to US and vice versa.

Moreover, the significant differences in male and female millennials suggest different approach in designing financial and investment plans for different genders. Males are surveyed to be more aggressive in terms of risk profile. Therefore, financial consultants and portfolio managers can suggest a more active and risky financial or investment plan for male and a more conservative one for female client.

The third implication is that a change in financial knowledge does account for the change in the risk capacity, risk need and risk preference. Hence, financial service providers can influence their clients by educating them. By educating their clients, financial service providers or portfolio managers can encourage their clients to be more risk-aggressive. By doing so, clients would be more likely to choose more active strategies, resulting in higher management fees and higher salaries for financial service employees and higher profits for the organizations.

6.4. Suggestions for Further Research

Future research can improve on this thesis paper by expanding the sample size. By collecting a larger data set, the study's result can be more meaningful as they will better represent the population. Based on this study, future research can also determine other factors that influence the risk profiles' determinant other than financial knowledge and gender. They can also use the methodology of this study to conduct different researches to study the effect of other factors on investment risk profile. Other researchers can also conduct their own study to determine why the differences in nationality does not affect the risk profile. In other words, they can study the effect of culture and geography on investment risk profile. Nonetheless, further study should include a more comprehensive and detailed survey, as this paper only acts as the stepping stone for future references.

Appendices

Table 3.1: Full questionnaire

1. Please rate your level of financial knowledge. Please click on the option that you choose.

Very low	1	2	3	4	5	Very High

2. What percentage of your monthly income would you be willing to spend on lotteries if you know that there is 50% chance of winning 100% of your investment or losing 90% of what you spend?
    a. 0%
    b. 20%
    c. 40%
    d. 60%
    e. 80%

3. How would you allocate your investment portfolio?
    a. 100% safe assets
    b. 30% risky assets, 70% safe assets
    c. 50% risky assets, 50% safe assets
    d. 70% risky assets, 30% safe assets
    e. 100% risky assets

4. Please select the most attractive portfolio to you.
    a. 20% risky assets, 80% safe assets, 5% expected return
    b. 35% risky assets, 65% safe assets, 7.5% expected return
    c. 50% risky assets, 50% safe assets, 10% expected return
    d. 65% risky assets, 35% safe assets, 14% expected return
    e. 80% risky assets, 20% safe assets, 20% expected return

5. Which nationality group do you belong to?
    a. European
    b. US

6. What is your gender?

a. Male
b. Female
c. Other

7. In what year were you born? Please specify _____

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